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(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 500 049 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
29.04.1998 Bulletin 1998/18

(51) Int Cl. 6: G11B 20/10

(21) Application number: 92102686.0

(22) Date of filing: 18.02.1992

(54) Recording apparatus, and recording/reproducing system

Aufzeichnungsgerät und Aufzeichnungs-/Wiedergabesystem

Appareil d'enregistrement et système d'enregistrement/de reproduction

(84) Designated Contracting States:
DE ES FR GB IT NL

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(30) Priority: 19.02.1991 JP 24455/91

(43) Date of publication of application:
26.08.1992 Bulletin 1992/35

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EP 0 500 049 B1

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EP 0 500 049 B1

Description**Background of the Invention:****5 Field of the Invention:**

This invention relates to recording and reproduction of information signals to be performed for a high-definition television display, a decoder, a four-channel VTR, a two-channel VTR, an ordinary audio apparatus or the like.

10 Description of the Related Art:

Compared with the conventional TV, a system called "high-definition television" reproduces an image which gives a much greater feeling of presence by virtue of its visual function based on a high-definition and large display.

15 Meanwhile, a stereophonic audio system having four independent audio channels has been proposed as an audio system suited for the high-definition television. To minimize a directional discrepancy between a pictorial image and a sound image irrespectively of auditorial positions, this audio system is arranged to have three of the four channels allocated in front of the display while the remaining one channel (with a plurality of speaker) is allocated in the rear for the purpose of attaining a surrounding effect or creating a state of having a sound source in the rear. The stereophonic system having three channels in front and one in rear of the display is called a 3-1 system.

20 This system gives four-channel stereophonic audio signals including an L (left) signal which is an audio signal from a front left part, an R (right) signal which is an audio signal from a front right part, a C (center) signal which is an audio signal from a front middle part and an S (surround) signal which is an audio signal from a rear part.

25 In converting a high-definition television program which is prepared with the above-stated four-channel (hereinafter referred to as 4-ch) stereophonic audio signals into two-channel (hereinafter referred to as 2-ch stereophonic audio signals, a conversion matrix of

$$L' = L + 0.7 C + 0.7 S$$

30 $R' = R + 0.7 C + 0.7 S$

is used to obtain the 2-ch (L' and R') audio signals. It is known that the use of this conversion matrix gives a stereophonic feeling which is almost the same as a feeling obtainable from a high-definition television program which is originally prepared with 2-ch stereophonic audio signals.

35 Such a conversion concept is known from document "Hi-Vision Technology" (November, 1988, by the Nihon Hosokai).

40 Referring to Figs. 5, 6 and 7 of the accompanying drawings, a conventional 4-ch VTR which is arranged to record and reproduce high-definition television audio signals is described as follows: Fig. 5 shows the typical arrangement of the conventional digital recording/reproducing system for audio signals. Fig. 6 shows a format used by the 4-ch VTR for recording on a magnetic tape. Fig. 7 shows the arrangement of the conventional 4-ch VTR.

45 Referring to Fig. 5, the illustration includes an input terminal 1; an A/D (analog-to-digital) converter 2; an error correction code (ECC) encoder 3; a modulator 4; a recording amplifier 5; a recording/reproducing mechanical part 6; a reproduction amplifier 7; a demodulator 8; an ECC decoder 9; a D/A (digital-to-analog) converter 10; and an output terminal 11.

50 The digital recording/reproducing system having the above-stated component parts performs recording and reproduction in the following manner. When an audio signal is applied to the input terminal 1, the audio signal which is an analog signal is converted into a digital signal by the A/D converter 2. At the ECC encoder 3, an error correction code (ECC) is added to the digital signal and a shuffling process is performed to rearrange the signal in the direction of time. After the shuffling, the signal is applied to the modulator 4 to be subjected to a digital modulation process.

55 The output of the modulator 4 is amplified by the recording amplifier 5. The output of the recording amplifier 5 is supplied to the recording/reproducing mechanical part 6 to be recorded on a magnetic tape which is employed as an information recording medium. The recorded signal is read out by the recording/reproducing mechanical part 6 and is supplied via the reproduction amplifier 7 to the demodulator 8 to be subjected to a digital demodulation process. The output of the demodulator 8 is supplied to the ECC decoder 9. The ECC decoder 9 corrects any code error of the reproduced signal and also performs a deshuffling process to rearrange the signal back to its original state. The signal thus deshuffled is converted into an analog audio signal by the D/A converter 10 and is output from the output terminal 11.

In Fig. 6, a reference numeral 12 denotes a magnetic tape. Numerals 13, 14, 16 and 17 denote audio signal tracks. Each of these tracks is arranged to have an audio signal recorded therein for one channel. A numeral 15 denotes a video signal track. A numeral 18 denotes a recording track provided for recording a control signal for controlling the mode of audio signals.

In recording 4-ch stereophonic signals (L, R, C and S signals) mentioned above, for example, the L signal is recorded in the track 17; the R signal in the track 16; the C signal in the track 14; and the S signal in the track 13. In a case where the 4-ch audio signals (CH1, CH2, CH3 and CH4 signals) of a system other than the above-stated stereophonic audio system are to be recorded, the CH1 signal is recorded in the track 17; the CH2 signal in the track 16; the CH3 signal in the track 14; and the CH4 signal in the track 13.

Referring to Fig. 7, the audio signal input and output sources of the VTR are first described as follows:

In Fig. 7, reference numerals 20, 21 and 22 respectively denote the line output arrangement of the input sources, including the line output terminals of a PCM decoder, a 4-ch VTR and a 2-ch VTR. A numeral 23 denotes a line input selection circuit. Audio signals of four or two channels coming from the input sources 20, 21 or 22 are multiplexed in a time-sharing manner to be recorded on a magnetic tape 12 by a head 19.

A video signal which is input also to the 4-ch VTR comes to a video signal recording processing circuit 29 to be processed there into a state of being recordable on the magnetic tape 12. The video signal thus processed is recorded after it is multiplexed in a time sharing manner with the audio signals.

The recorded audio signals are read out by the head 19 and are output from line output terminals 24. The audio signals output are received through the line input terminals of signal sources 25, 26, 27 and 28.

The recorded video signal is read out by the head 19. A video signal reproduction processing circuit 30 then processes the video signal in a manner reverse to the processing operation of the video signal recording processing circuit 29.

Further, in transmitting the high-definition television audio signals, the sounds can be transmitted in sound modes of varied kinds by means of audio control codes.

In a case where the input signals from the PCM decoder is an L signal, an R signal, a main sound signal and a sub-sound signal, for example, the R signal is recorded in the track 16, the L signal in the track 17, the sub-sound signal in the track 13 and the main sound signal in the track 14 on the magnetic tape 12 as shown in Fig. 6. In reproducing the record for dubbing by using a 4-ch VTR 27, for example, the L signal, the R signal, the main sound signal and the sub-sound signal are respectively output to the line output terminals (1) to (4). A control signal is output along with these audio signal outputs. The arrangement described above has been generally employed for high-definition television audio signal transmission from one apparatus to another.

However, the conventional 4-ch recording or reproducing VTR has the following shortcomings: With the L, R, C and S audio signals recorded, in cases where, for example, the record obtained by four channels is to be dubbed by a 2-ch VTR or where amplifiers disposed within a high-definition (HD) display device are for two-channel reproduction, it is only the L and R signals that can be reproduced. Such conditions not only deform the original sound image but also give such sounds that differ in quality from the sounds of the conventional 2-ch stereophonic reproduction. Another shortcoming of the conventional VTR resides in that the VTR is provided with no after-recording arrangement.

Summary of the Invention:

It is a principal object of this invention to provide a recording apparatus, a reproducing apparatus and a recording/reproducing system which solve the above-stated problems of the conventional 4-ch VTR and are capable of transmitting high-definition television audio signals to another apparatus, such as a 2-ch VTR, without deforming the sound image of the audio signals.

According to the present invention, this object is accomplished by a recording apparatus according to claim 1, a reproducing apparatus according to claim 7, a recording/reproducing system according to claim 12, a recording method according to claim 13 and a reproducing method according to claim 14.

Other objects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

Brief Description of the Drawings:

Fig. 1 is a diagram showing the arrangement of the recording system of a 4-ch VTR arranged as a first embodiment of this invention. Fig. 2 is a diagram showing the arrangement of the reproducing system of the 4-ch VTR arranged as the first embodiment. Fig. 3 shows a recording format for recording on a magnetic tape with the embodiment of the invention. Fig. 4 is a diagram showing the recording system of a 4-ch VTR which includes an after-recording arrangement and is arranged as a second embodiment of the invention. Fig. 5 is a block diagram showing the arrangement of a digital recording/reproducing system generally employed for recording and reproducing high-definition television

EP 0 500 049 B1

audio signals. Fig. 6 shows a recording format for recording on a magnetic tape with the conventional 4-ch VTR. Fig. 7 shows the arrangement of the conventional 4-ch VTR.

5 Detailed Description of the Preferred Embodiments:

The following describes a recording/reproducing system (a 4-ch VTR) arranged as a first embodiment of the invention with reference to Figs. 1 and 2:

10 Fig. 1 shows the arrangement of the recording system of the 4-ch (four-channel) VTR which is the first embodiment of the invention and Fig. 2 that of the reproducing system of the same 4-ch VTR. In Figs. 1 and 2, the parts which are the same as or equivalent to the parts shown in Fig. 7 are indicated by the same reference numerals as in Fig. 7 and the details of them are omitted from description. Referring to Figs. 1 and 2:

15 A matrix processing circuit 31 is arranged to form 2-ch (two-channel) stereophonic signals L' and R' (converted audio signals) by performing a converting matrix process on high-definition television audio signals L, R, C and S as follows: $L' = L + 0.7C + 0.7S$ and $R' = R + 0.7C + 0.7S$.

20 A control signal discrimination circuit 32 is arranged to discriminate the mode of the audio signals. A control signal rewriting circuit 33 is arranged to rewrite a control signal when the matrix process is performed on the audio signals. While the control signal discrimination circuit 32 and the control signal rewriting circuit 33 are shown as separately included in both the recording and reproducing systems in Figs. 1 and 2, they are arranged in actuality to be used in common for recording and reproduction. A switch 34 is controlled according to the mode of the audio signal found by the control signal discrimination circuit 32. A reverse-matrix processing circuit 35 is arranged to restore the L' and R' audio signals to the input L and R audio signals by performing a reverse converting matrix process on the L' and R' audio signals as follows: $L = L' - 0.7C - 0.7S$ and $R = R' - 0.7C - 0.7S$.

25 The operation of the recording system of the 4-ch VTR which is arranged as the first embodiment of this invention as described above is described as follows with reference to Fig. 1:

30 When the audio signals are input to the 4-ch VTR, a control signal for the audio signals is input to the control signal discrimination circuit 32. The mode of the audio signals (hereinafter referred to as the audio mode) is discriminated by the circuit 32. The operation of the switch 34 is controlled according to the audio mode. The method for controlling the switch 34 is as follows: The switch 34 is connected to the lines of terminals 37 which are disposed on one side of switch positions when 3-ch or 4-ch stereophonic audio signals (L, R and C or L, R, C and S) are included in the input audio signals. The switch 34 is connected to the lines of other terminals 36 which are on the other side of the switch positions in the event of other input audio signals.

35 Therefore, in cases where 3-ch or 4-ch stereophonic audio signals are included in the input audio signals, the matrix processing circuit 31 performs the above-stated matrix conversion. As a result, signals are recorded on a recording medium in the form of a magnetic tape 12 in accordance with a recording format which is as shown in Fig. 3.

If the input audio signals do not include the 3-ch or 4-ch stereophonic audio signals, input audio signals CH1, CH2, CH3 and CH4 are recorded on the magnetic tape 12 as they are, as shown in Fig. 3.

40 A video signal is recorded or reproduced in the same manner as the conventional 4-ch VTR.

45 Next, the operation of the reproducing system of the 4-ch VTR arranged as the first embodiment of this invention is described as follows, with reference to Fig. 2: In transmitting the audio signals recorded on the magnetic tape 12 to a high-definition (HD) display device 28, a control signal which is also recorded on the magnetic tape 12 is first input to the control signal discrimination circuit 32. The circuit 32 then discriminates the audio mode to decide whether the recorded audio signals are to be subjected to the reverse matrix process.

50 This decision is made as follows: The reverse-matrix processing circuit 35 is turned on to perform the reverse matrix process on the recorded audio signals if 3-ch or 4-ch stereophonic audio signals are included in the audio signals recorded on the magnetic tape 12. The reverse-matrix processing circuit 35 is turned off to allow the recorded audio signals to be output as they are if the recorded audio signals are other than the 3-ch or 4-ch stereophonic audio signals.

55 In a case where amplifiers disposed within the HD display device 28 are only for two-channel reproduction, a switch which is included in the reverse-matrix processing circuit 35 turns off to prevent the reverse matrix process from being performed even if 3-ch or 4-ch stereophonic audio signals are recorded on the magnetic tape 12. Further, when the reverse matrix process is performed on the audio signals recorded on the magnetic tape 12, the control signal which is also recorded on the magnetic tape 12 is input to the control signal rewriting circuit 33 to be rewritten and to be output in a renewed state.

55 In a case where the audio signals recorded on the magnetic tape 12 are transmitted to a device other than the HD display device 28, such as a 2-ch VTR 25, an existing amplifier 26 and a 4-ch VTR 27, the audio signals recorded are output as they are. However, if the audio signals recorded on the magnetic tape 12 are a main sound signal and a sub-sound signal and are transmitted to the existing amplifier 26, the existing amplifier 26 would be incapable of selecting

the main or sub-sound signal. The VTR is, therefore, provided with a switch 51 which permits manual selection to be made in such a case.

Table 1 below shows relations between the input audio signals subjected to the matrix process or no matrix process and the output audio signals. Table 2 shows relations between the recorded audio signals subjected to the reverse matrix process or no reverse matrix process and the output audio signals.

Table 1

Input audio signals	Matrix processing circuit	Output signals
4-ch (3-1 system) stereophonic L, R, C, S	processed	L', R', C, S
3-ch stereo. + 1 monaural, L, R, C, sub	processed	L', R', C, sub
3-ch stereo. L, R, C, -	processed	L', R', C, -
Other signals	not processed	in input states

Table 2

Audio signals recorded on magnetic tape	Reverse-matrix processing circuit	Output signals
L', R', C, S	processed	L, R, C, S
L', R', C, sub	*	L, R, C, sub
L', R', C, -	*	L, R, C, -
Other signals	not processed	in recorded states

A recording/reproducing system (4-ch VTR) which is arranged as a second embodiment of this invention and includes an after-recording arrangement is described below with reference to Fig. 4:

Fig. 4 shows the arrangement of the recording system of the 4-ch VTR which includes the after-recording arrangement. In Fig. 4, parts which are the same as or equivalent to the parts shown in Fig. 1 are indicated by the same reference numerals as in Fig. 1 and the details of them are omitted from the following description.

After-recording audio signals 52 are arranged to be supplied to a line input circuit. An after-recording processing circuit 53 is arranged to perform a switching action by means of switches 53a and 53b according to a control signal which is input to the control signal discrimination circuit 32. In the case of after-recording, the VTR performs a recording operation as follows:

The after-recording audio signals 52 of two channels are input via the line input circuit to the after-recording processing circuit 53. At the circuit 53, the switches 53a and 53b are then respectively connected to contacts on their sides A. During the process of after-recording, the audio signals recorded in the audio signal tracks 16 and 17 as shown in Fig. 3 are left intact while the after-recording audio signals of two channels are recorded in other audio signal tracks 13 and 14. At this time, the control signal input is rewritten by the control signal rewriting circuit 33 before the control signal is recorded on the magnetic tape 12 because of the after-recording process performed.

Recording actions other than the after-recording are performed in the same manner as those of the first embodiment, except that: For other recording actions, the switches 53a and 53b are connected to contacts on their other sides N.

The reproducing system of the second embodiment is arranged in the same manner as in the first embodiment. In the second embodiment, the reproducing system operates as follows: The signals recorded on the magnetic tape 12 through the after-recording process are output to the outside of the system without being subjected to the reverse matrix process irrespectively of the contents of the audio signal of each channel. The control signal discrimination circuit 32 makes a discrimination between performing and not performing the reverse matrix process.

With 4-ch stereophonic audio signals (of the 3-1 system, for example) input, the arrangement described in the foregoing enables each of the embodiments to transmit the audio signals without deforming their original sound images even in cases where only the audio signals of two channels are to be output, for example, for dubbing with a 2-ch VTR or where the amplifiers disposed within an HD display device are arranged for 2-ch reproduction. Further, even if after-recording is to be performed on a magnetic tape on which high-definition television audio signals have been recorded, after-recording audio signals can be recorded without impairing the sound quality of reproduction.

While this invention has been described through its preferred embodiments, it is to be understood that the invention may be practiced otherwise in further various forms. For example, while each of the embodiments described is arranged to use a magnetic tape as a recording medium, the recording medium usable according to this invention is of course

EP 0 500 049 B1

not limited to the magnetic tape and may be a magnetic disc, an optical disc or the like.

Further, the first embodiment may be modified to perform control by arranging the switch 34 within the matrix processing circuit 31. In the second embodiment, the after-recording processing circuit 53 is arranged to be turned on and off by means of the control signal of the after-recording audio signals 52. This arrangement may be changed to perform the switching action on the circuit 53 with a manual on/off switch to input a signal to the control signal discrimination circuit 32 and the after-recording processing circuit 53. Further, according to the foregoing description, the audio signal input for the after-recording is arranged in two channels. However, the number of channels may be changed to one channel or to three channels. In either case, the after-recording process can be likewise performed on the audio signal input.

10

Claims

1. A recording apparatus comprising:

15

- a) input means (20-23, 52) for inputting four-channel stereophonic audio signals, the four-channel stereophonic audio signals comprising an L (L stands for left) signal for left front sounds, an R (R stands for right) signal for right front sounds and other two predetermined signals;
- 20 b) converting means (31) for forming converted two-channel audio signals (L', R') by using the four-channel stereophonic audio signals input to said input means (20-23, 52), the converted two-channel audio signals comprising a signal being obtained by adding the L signal and the two predetermined signals, wherein at least one of the two predetermined signals is weighted, and another signal being obtained by adding the R signal and the two predetermined signals, wherein at least one of the two predetermined signals is weighted;
- 25 c) recording means (12, 19, 29) for recording the converted two-channel audio signals (L', R') on a recording medium (12),

characterized in that

said recording means is arranged to record the two predetermined signals to thereby form four-channel stereophonic audio signals on said recording medium.

30

2. An apparatus according to claim 1, wherein said input means (20-23, 52) includes an after-recording input part (52) for inputting two-channel after-recording audio signals.
- 35 3. An apparatus according to claim 2, wherein said recording means (12, 19, 29) is arranged to record the two-channel after recording audio signals input from said after-recording input part on the recording medium (12) in an area arranged for recording the two predetermined audio signals included in the four-channel stereophonic audio signals.
- 40 4. An apparatus according to claim 1, wherein said recording means (12, 19, 29) is arranged to record any arbitrary four-channel audio signals not corresponding to said four-channel stereophonic audio signals (L, R, C, S) in place of said converted two-channel audio signals and said two predetermined signals.
- 45 5. An apparatus according to claim 1, wherein said four-channel stereophonic audio signals further include besides said L (left) signal for left front sounds and said R (right) signal for right front sounds, a C (center) signal for center sounds and an S (surround) signal for rear sounds.
- 50 6. An apparatus according to claim 5, wherein said two predetermined audio signals of two specific channels other than said converted two-channel audio signals (L', R') included in the four-channel recording audio signals are said C and S signals.
7. A reproducing apparatus for reproducing audio signals recorded on a recording medium by a recording apparatus according to claim 1, comprising:
 - 55 a) restoring means (35) for restoring the recording four-channel stereophonic audio signals by performing a reverse conversion on the reproduced converted two-channel audio signals using the reproduced two predetermined signals,
 - b) selection means (53, 53a, 53b) for selectively outputting the four-channel stereophonic audio signals or the

converted two-channel audio signals (L', R').

8. An apparatus according to claim 7, wherein said four-channel stereophonic audio signals further include besides said L (left) signal for left front sounds and said R (right) signal for right front sounds, a C (center) signal for center sounds and an S (surround) signal for rear sounds

9. An apparatus according to claim 8, wherein said two predetermined audio signals of two specific channels other than said converted two-channel audio signals included in the four-channel recording audio signals are said C and S signals.

10. An apparatus according to claim 1, wherein said recording means (12, 19, 29) is capable of further recording image information.

11. An apparatus according to claim 1, wherein said recording medium (12) is a magnetic tape (12).

12. A recording/reproducing system comprising:

- a) a recording apparatus for recording audio signals as defined in claim 1;
- b) a reproducing apparatus for reproducing the audio signals as defined in claim 7.

13. Recording method, comprising the steps of:

a) inputting, by an input means (20-23, 52), four-channel stereophonic audio signals, the four-channel stereophonic audio signals comprising an L (L stands for left) signal for left front sounds, an R (R stands for right) signal for right front sounds and other two predetermined signals,

20 b) forming, by a converting means (31) converted two-channel audio signals (L', R') by using the four-channel stereophonic audio signals input to said input means (20-23, 52), the converted two-channel audio signals comprising a signal being obtained by adding the L signal and the two predetermined signals, wherein at least one of the two predetermined signals is weighted, and another signal being obtained by adding the R signal and the two predetermined signals, wherein at least one of the two predetermined signals is weighted, and

25 c) recording, by a recording means (12, 19, 29), the converted two-channel audio signals (L', R') on a recording medium (12).

30 characterized by the step of

35 arranging said recording means to record the two predetermined signals to thereby form four-channel stereophonic audio signals on said recording medium.

40 14. Reproducing method of reproducing audio signals recorded on a recording medium by a recording apparatus according to claim 1, comprising the steps of

45 a) restoring, by a restoring means (35), the recording four-channel stereophonic audio signals by performing a reverse conversion of the reproduced converted two-channel audio signals using the reproduced two predetermined signals, and

50 b) selectively outputting, by a selection means (53, 53a, 53b) the four-channel stereophonic audio signals or the converted two-channel audio signals (L', R').

50 Patentansprüche

1. Aufzeichnungsvorrichtung mit

55 a) einer Eingabeeinrichtung (20-23, 52) zur Eingabe von Vier-Kanal-Stereo-Audiosignalen, wobei die Vier-Kanal-Stereo-Audiosignale ein L (L steht für links)- Signal für linke vordere Klänge, ein R (R steht für rechts)- Signal für rechte vordere Klänge und zwei andere vorbestimmte Signale aufweisen,

b) einer Umwandlungseinrichtung (31) zur Erzeugung umgewandelter Zwei-Kanal-Audiosignale (L', R') unter Verwendung der in die Eingabeeinrichtung (20-23, 52) eingegebenen Vier-Kanal-Stereo-Audiosignale, wobei

EP 0 500 049 B1

die umgewandelten Zwei-Kanal-Audiosignale ein Signal aufweisen, das durch Zuführung des L- Signals und der zwei vorbestimmten Signale erhalten wird, wobei zumindest eines der zwei vorbestimmten Signale gewichtet ist, und ein anderes Signal, das durch Zuführung des R- Signals und der zwei vorbestimmten Signale erhalten wird, wobei zumindest eines der zwei vorbestimmten Signale gewichtet ist, und
5 (c) einer Aufzeichnungseinrichtung (12, 19, 29) zur Aufzeichnung der umgewandelten Zwei-Kanal-Audiosignale (L', R') auf einem Aufzeichnungsträger (12),

dadurch gekennzeichnet, daß
10 die Aufzeichnungseinrichtung die zwei vorbestimmten Signale aufzeichnet, um dabei Vier-Kanal-Stereo-AudioSignale auf dem Aufzeichnungsträger zu erzeugen.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
15 die Eingabeeinrichtung (20-23, 52) einen Nachaufzeichnungs-Eingabeteil (52) zur Eingabe von Zwei-Kanal-Nachaufzeichnungs-Audiosignalen aufweist.

3. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet, daß
20 die Aufzeichnungseinrichtung (12, 19, 29) die von dem Nachaufzeichnungs-Eingabeteil eingegebenen Zwei-Kanal-Nachaufzeichnungs-Audiosignale auf dem Aufzeichnungsträger (12) in einem Bereich aufzeichnet, der die in den Vier-Kanal-Stereo-Audiosignalen enthaltenen zwei vorbestimmten Audiosignale aufzeichnet.

4. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
25 die Aufzeichnungseinrichtung (12, 19, 29) beliebige Vier-Kanal-Audiosignale, die den Vier-Kanal-Stereo-Audiosignalen (L, R, C, S) nicht entsprechen, anstelle der umgewandelten Zwei-Kanal-Audiosignale und der zwei vorbestimmten Signale aufzeichnet.

5. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
30 die Vier-Kanal-Stereo-Audiosignale, neben dem L (linken)- Signal für linke vordere Klänge und dem R (rechten)- Signal für rechte vordere Klänge, ein C (zentrales)- Signal für zentrale Klänge und ein S (Umgebungs)- Signal für rückwärtige Klänge aufweist.

35 6. Vorrichtung nach Anspruch 5,
dadurch gekennzeichnet, daß
die sich von den in den Vier-Kanal-Aufzeichnungs-Audiosignalen enthaltenen, umgewandelten Zwei-Kanal-Audiosignalen (L', R') unterscheidenden, zwei vorbestimmten Audiosignale von zwei bestimmten Kanälen die C- und S- Signale sind.

40 7. Wiedergabevorrichtung zur Wiedergabe von durch eine Aufzeichnungsvorrichtung nach Anspruch 1 auf einem Aufzeichnungsträger aufgezeichneten Audiosignalen,
gekennzeichnet durch

45 a) eine Wiederherstellleinrichtung (35) zur Wiederherstellung des Aufzeichnungs-Vier-Kanal-Stereo-Audiosignals durch Ausführung einer Umkehrumwandlung der wiedergegebenen, umgewandelten Zwei-Kanal-Audiosignale unter Verwendung der wiedergegebenen zwei vorbestimmten Signale und
b) eine Auswahlleinrichtung (53, 53a, 53b) zur wahlweisen Ausgabe der Vier-Kanal-Stereo-Audiosignale oder der umgewandelten Zwei-Kanal-Audiosignale (L', R').

50 8. Vorrichtung nach Anspruch 7,
dadurch gekennzeichnet, daß
die Vier-Kanal-Stereo-Audiosignale neben dem L (linken)- Signal für linke vordere Klänge und dem R (rechten)- Signal für rechte vordere Klänge ein C (zentrales)- Signal für zentrale Klänge und ein S (Umgebungs)- Signal für rückwärtige Klänge enthalten.

55 9. Vorrichtung nach Anspruch 8,
dadurch gekennzeichnet, daß

die sich von den in den Vier-Kanal-Aufzeichnungs-Audiosignalen enthaltenen, umgewandelten Zwei-Kanal-Audiosignalen unterscheidenden, zwei vorbestimmten Audiosignale von zwei bestimmten Kanälen die C- und S-Signale sind.

5 10. Vorrichtung nach Anspruch 1,
 dadurch gekennzeichnet, daß
 die Aufzeichnungseinrichtung (12, 19, 29) zur weiteren Aufzeichnung von Bildinformationen geeignet ist.

10 11. Vorrichtung nach Anspruch 1,
 dadurch gekennzeichnet, daß
 der Aufzeichnungsträger (12) ein Magnetband (12) ist.

15 12. Aufzeichnungs/Wiedergabesystem mit
 a) einer Aufzeichnungsvorrichtung zur Aufzeichnung von Audiosignalen nach Anspruch 1, und
 b) einer Wiedergabevorrichtung zur Wiedergabe der Audiosignale nach Anspruch 7.

20 13. Aufzeichnungsverfahren mit den Schritten
 a) Eingeben von Vier-Kanal-Stereo-Audiosignalen mittels einer Eingabeeinrichtung (20-23, 52), wobei die Vier-Kanal-Stereo-Audiosignale ein L (L steht für links)Signal für linke vordere Klänge, ein R (R steht für rechts)- Signal für rechte vordere Klänge und zwei andere vorbestimmte Signale aufweisen,
 Erzeugen von umgewandelten Zwei-Kanal-Audiosignalen (L' , R') durch eine Umwandlungseinrichtung (31) unter Verwendung der in die Eingabeeinrichtung (20-23, 52) eingegebenen Vier-Kanal-Stereo-Audiosignale, wobei die umgewandelten Zwei-Kanal-Audiosignale ein Signal aufweisen, das durch Zuführen des L- Signals und der zwei vorbestimmten Signale erhalten wird, wobei zumindest eines der zwei vorbestimmten Signale gewichtet wird, und ein anderes Signal, das durch Zuführen des R- Signals und der zwei vorbestimmten Signale erhalten wird, wobei zumindest eines der zwei vorbestimmten Signale gewichtet wird, und
 c) Aufzeichnen der umgewandelten Zwei-Kanal-Audiosignale (L' , R') auf einem Aufzeichnungsträger (12) durch eine Aufzeichnungseinrichtung (12, 19, 29),

25 30 35 gekennzeichnet durch den Schritt
 Aufzeichnen der zwei vorbestimmten Signale durch die Aufzeichnungseinrichtung, um dadurch Vier-Kanal-Stereo-Audiosignale auf dem Aufzeichnungsträger zu erzeugen.

40 14. Wiedergabeverfahren zum Wiedergeben von auf einem Aufzeichnungsträger durch eine Aufzeichnungsvorrichtung nach Anspruch 1 aufgezeichneten Audiosignalen,
 gekennzeichnet durch die Schritte
 a) Wiederherstellen der Aufzeichnungs-Vier-Kanal-Stereo-Audiosignale durch eine Wiederherstelleneinrichtung (35) durch Ausführen einer Umkehrumwandlung der wiedergegebenen, umgewandelten Zwei-Kanal-Audio-signale unter Verwendung der wiedergegebenen, zwei vorbestimmten Signale und
 b) wahlweises Ausgeben der Vier-Kanal-Stereo-Audiosignale oder der umgewandelten Zwei-Kanal-Audiosignale (L' , R') durch eine Auswahlseinrichtung (53, 53a, 53b).

50 **Revendications**

50 1. Appareil d'enregistrement comprenant :

55 a) un moyen d'entrée (20 à 23, 52) pour entrer des signaux audio stéréophoniques à quatre voies, les signaux audio stéréophoniques à quatre voies comprenant un signal G (G signifie gauche) pour les sons avant gauche, un signal D (D signifie droite) pour les sons avant droit et deux autres signaux prédéterminés ;
 b) un moyen de conversion (31) pour former des signaux audio à deux voies convertis (G' , D') en utilisant des signaux audio stéréophoniques à quatre voies entrés dans lesdits moyens d'entrée (20 à 23, 52), les signaux audio à deux voies convertis comprenant un signal qui est obtenu en ajoutant le signal G et les deux signaux

EP 0 500 049 B1

5 prédéterminés, dans lequel au moins un des deux signaux prédéterminés est pondéré et un autre signal est obtenu en ajoutant le signal D et les deux signaux prédéterminés, dans lequel au moins des deux signaux prédéterminés est pondéré ;

10 c) un moyen d'enregistrement (12, 19, 29) pour enregistrer des signaux audio à deux voies convertis (G', D') sur un support d'enregistrement (12),

caractérisé en ce que

15 ledit moyen d'enregistrement est conçu pour enregistrer les deux signaux prédéterminés afin de former de ce fait des signaux audio stéréophoniques à quatre voies sur ledit support d'enregistrement.

20 2. Appareil selon la revendication 1, dans lequel ledit moyen d'entrée (20 à 23, 52) comprend une partie d'entrée d'après enregistrement (52) pour entrer des signaux audio après enregistrement à deux voies.

25 3. Appareil selon la revendication 2, dans lequel ledit moyen d'enregistrement (12, 19, 29) est conçu pour enregistrer les signaux audio après enregistrement à deux voies entrés à partir de ladite partie d'entrée après enregistrement sur le support d'enregistrement (12) dans une zone conçue pour enregistrer les deux signaux audio prédéterminés inclus dans les signaux audio stéréophoniques à quatre voies.

30 4. Appareil selon la revendication 1, dans lequel ledit moyen d'enregistrement (12, 19, 29) est conçu pour enregistrer tous signaux audio à quatre voies arbitraires ne correspondant pas auxdits signaux audio stéréophoniques à quatre voies (G, D, C, S) à la place desdits signaux audio à deux voies convertis et desdits signaux audio prédéterminés.

25 5. Appareil selon la revendication 1, dans lequel lesdits signaux audio stéréophoniques à quatre voies comprennent de plus en dehors du signal G (gauche) pour les sons avant gauche et dudit signal D (droit) pour les sons avant droit, un signal C (centre) pour les sons au centre et un signal S (environnant) pour les sons arrière.

35 6. Appareil selon la revendication 5, dans lequel lesdits deux signaux audio prédéterminés des deux voies spécifiques autres que lesdits signaux audio à deux voies convertis (G', D') inclus dans les signaux audio d'enregistrement à quatre voies sont lesdits signaux C et S.

30 7. Appareil de reproduction pour reproduire des signaux audio enregistrés sur un support d'enregistrement par un appareil d'enregistrement selon la revendication 1, comprenant :

35 a) un moyen de restauration (35) pour restaurer les signaux audio stéréophoniques à quatre voies d'enregistrement en effectuant une conversion inverse sur les signaux audio à deux voies convertis reproduits en utilisant les deux signaux prédéterminés reproduits,

40 b) un moyen de sélection (53, 53a, 53b) pour sortir sélectivement des signaux audio stéréophoniques à quatre voies ou des signaux audio à deux voies convertis (G', D').

45 8. Appareil selon la revendication 7, dans lequel lesdits signaux audio stéréophoniques à quatre voies comprennent de plus, en dehors dudit signal G (gauche) pour les sons avant gauche et dudit signal D (droit) pour les sons avant droit, un signal C (central) pour les sons au centre et un signal S (environnant) pour les sons arrière.

50 9. Appareil selon la revendication 8, dans lequel les deux signaux audio prédéterminés des deux voies spécifiques autres que lesdits signaux audio à deux voies convertis inclus dans les signaux audio d'enregistrement à quatre voies sont lesdits signaux C et S.

10. Appareil selon la revendication 1, dans lequel ledit moyen d'enregistrement (12, 19, 29) est capable d'effectuer un autre enregistrement d'informations d'images.

55 11. Appareil selon la revendication 1, dans lequel ledit support d'enregistrement (12) est une bande magnétique (12).

12. Système d'enregistrement/reproduction comprenant :

60 a) un appareil d'enregistrement pour enregistrer des signaux audio comme défini dans la revendication 1 ;
b) un appareil de reproduction pour reproduire les signaux audio comme défini dans la revendication 7.

13. Procédé d'enregistrement comprenant les étapes consistant à :

5 a) entrer, par un moyen d'entrée (20 à 23, 52) des signaux audio stéréophoniques à quatre voies, les signaux audio stéréophoniques à quatre voies comprenant un signal G (G signifie gauche) pour les sons avant gauche, un signal D (D signifie droite) pour les sons avant droit et deux autres signaux prédéterminés,

10 5 former, par un moyen de conversion (31), des signaux audio à deux voies convertis (G', D') en utilisant les signaux audio stéréophoniques à quatre voies entrés dans lesdits moyens d'entrée (20 à 23, 52), les signaux audio à deux voies convertis comprenant un signal qui est obtenu en ajoutant le signal G et les deux signaux prédéterminés, dans lequel au moins un des deux signaux prédéterminés est pondéré, et un autre signal est obtenu en ajoutant le signal D et les deux signaux prédéterminés, dans lequel au moins un des deux signaux prédéterminés est pondéré, et

15 10 c) enregistrer, par des moyens d'enregistrement (12, 19, 29), les signaux audio à deux voies convertis (G', D') sur un support d'enregistrement (12),

15 15 caractérisé par les étapes consistant à concevoir ledit moyen d'enregistrement pour enregistrer les deux signaux prédéterminés pour former de ce fait des signaux audio stéréophoniques à quatre voies sur ledit support d'enregistrement.

20 20 14. Procédé de reproduction de signaux audio enregistrés sur un support d'enregistrement par un appareil d'enregistrement selon la revendication 1, comprenant les étapes consistant à

25 25 a) restaurer, par un moyen de restauration (35), les signaux audio stéréophoniques à quatre voies enregistrés en effectuant une conversion inverse des signaux audio à deux voies convertis et reproduits en utilisant les deux signaux prédéterminés reproduits, et

b) sortir sélectivement, par un moyen de sélection (53, 53a, 53b) les signaux audio stéréophoniques à quatre voies ou les signaux audio à deux voies convertis (G', D').

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EP 0 500 049 B1

FIG. 1

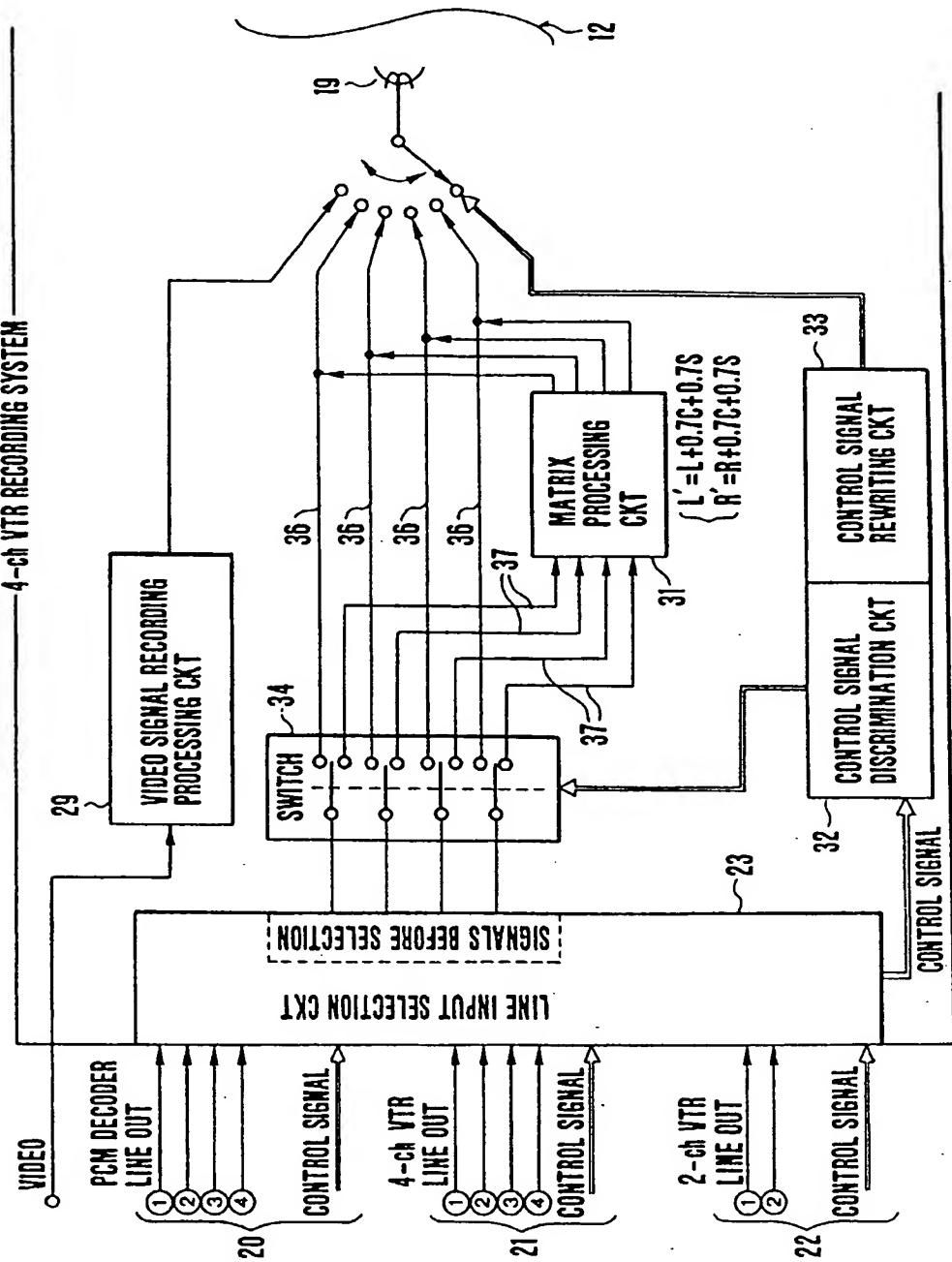
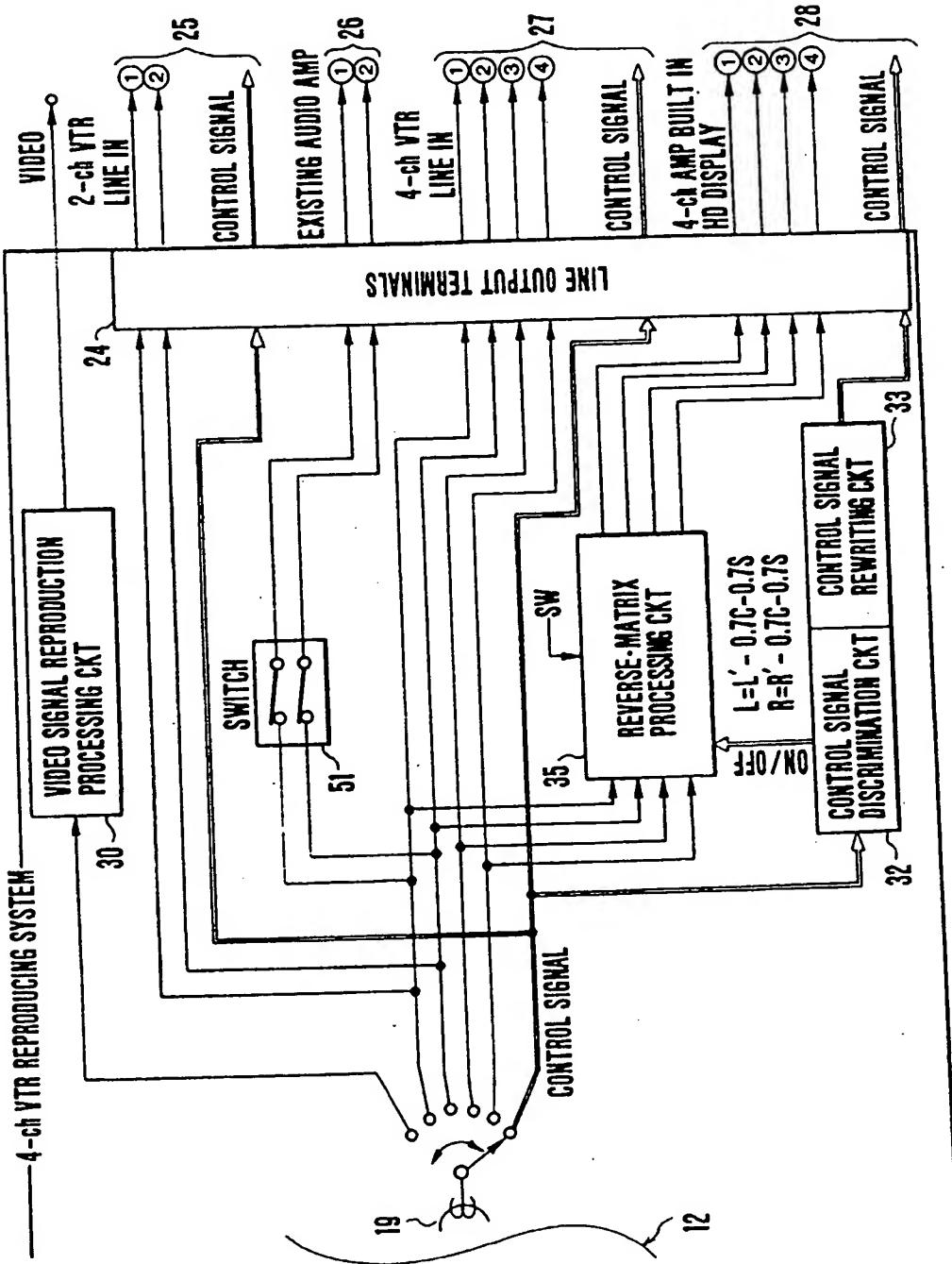


FIG.2



EP 0 500 049 B1

FIG.3

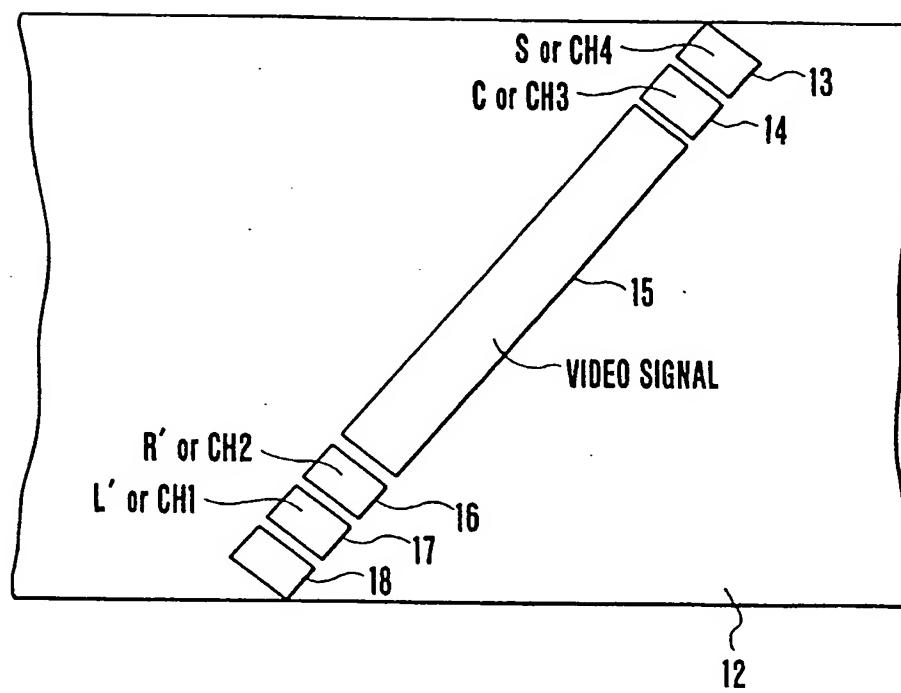
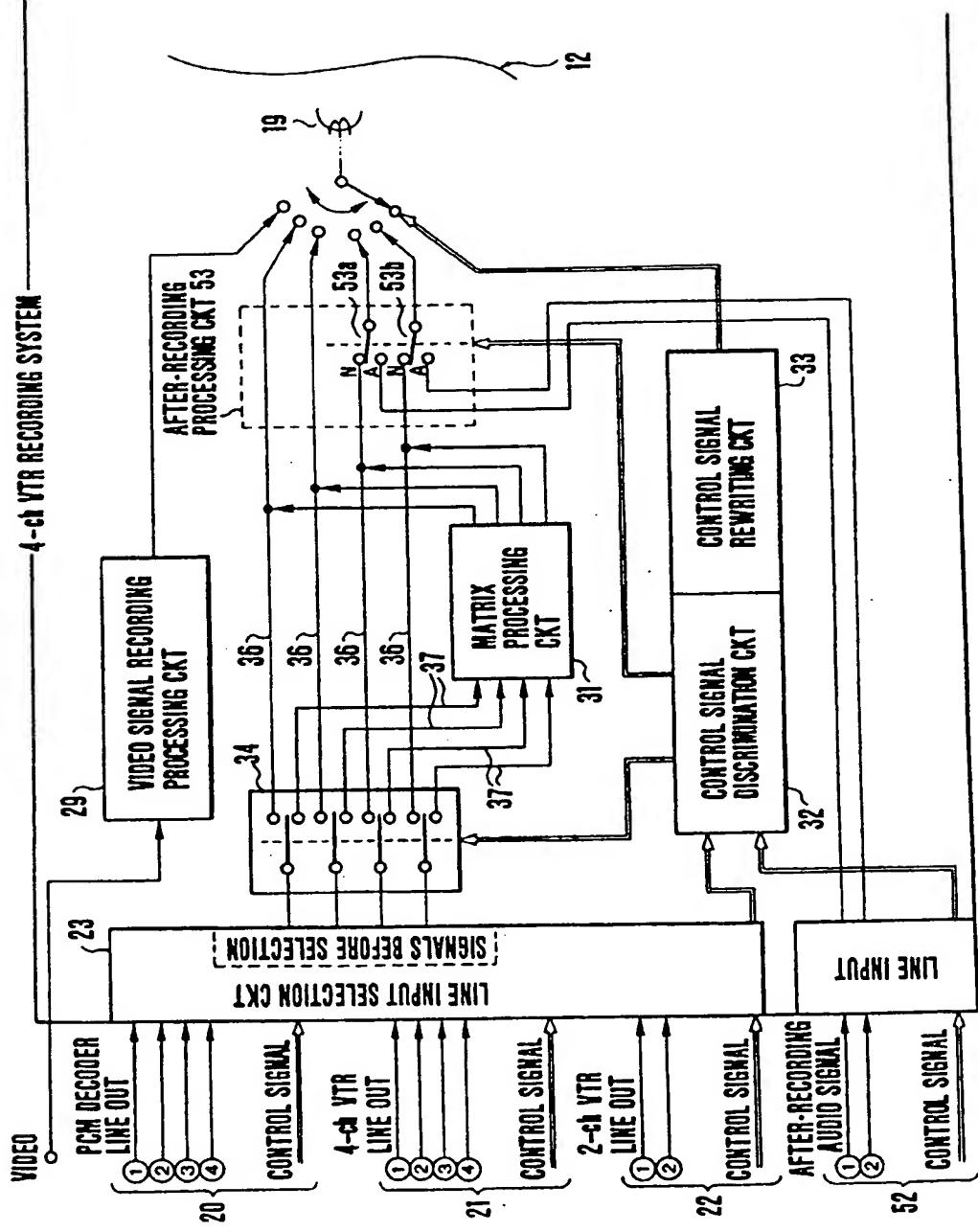


FIG.4



EP 0 500 049 B1

FIG.5

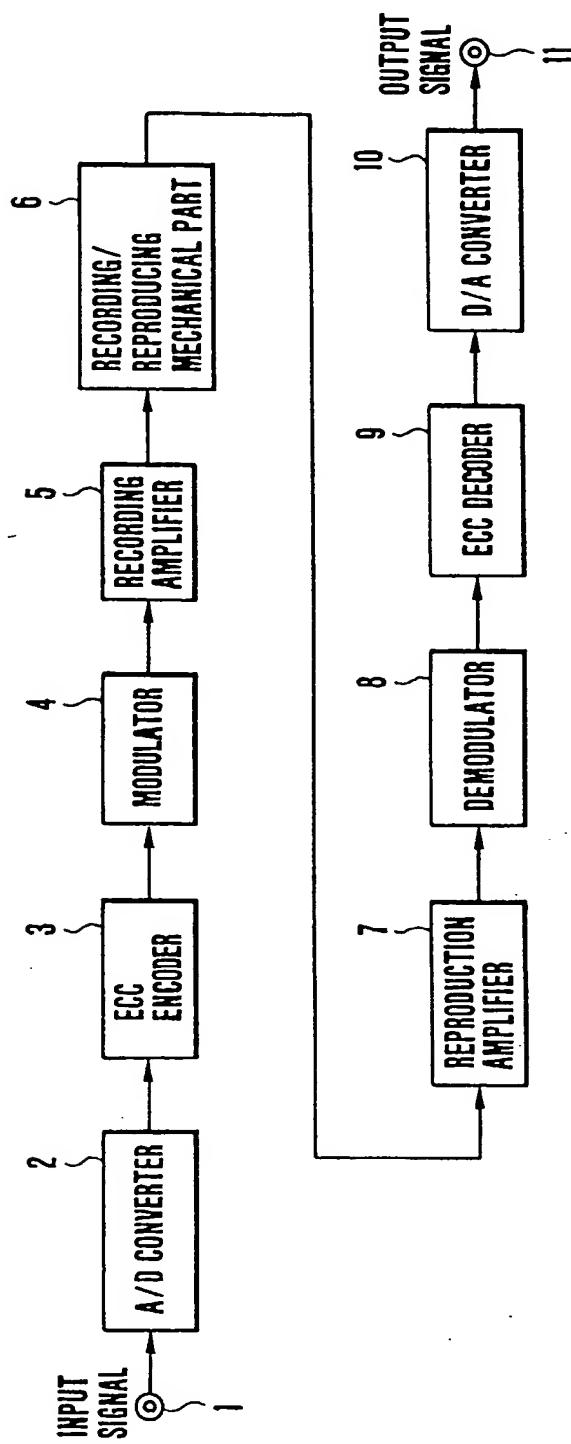
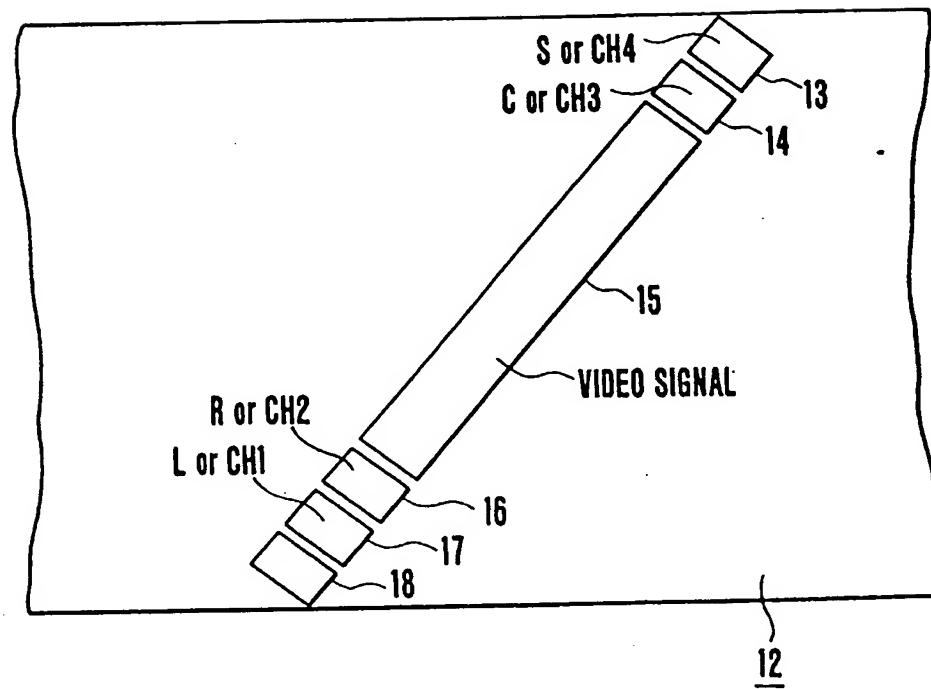


FIG.6



EP 0 500 049 B1

FIG. 7

